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THE WINE VALLEY OF NORTH PORTUGAL

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For hundreds of miles the Spanish river Duero wanders across the stark upland of Old Castille, but its valley has little that distinguishes it from the surrounding steppe-like country. Just before the Duero becomes the Portuguese Douro, however, it descends into the lower portion of its valley, which it has cut deeply into the plateau. This Portuguese valley, because of its lower altitude and sheltered position, offers environmental conditions in every way different from the bordering uplands, where little else than scrubby pasture and poor fields of rye and potatoes may be found. The valley, producing olives, almonds, and citrus fruits, is a distinct zone of Mediterranean culture. Its specialization is in viticulture, and from its vineyards comes the strong, sweet wine known as Port.

Port is known the world over. Its unique flavor, with its strength and full body, have long made it a favorite dessert wine wherever fine wines are appreciated. It forms an integral part of the Frenchman's aperitif, it cheers the cold Scandinavian winter, and it revives the languid northerner stationed in the tropics. But it is an English drink par excellence. One naturally thinks of Port in terms of its English setting.

Half of the wine exported from Portugal goes to England, and half of the wine-exporting business in Portugal is handled by English firms. This curious trade situation is not solely the result of historical accident or individual enterprise, nor of English progressiveness or Portuguese backwardness. The Port wine trade, which is practically identical with the Portuguese export of wines, started and has continued as a geographic phenomenon.

ORIGIN OF THE TRADE

As early as the fifteenth century Portuguese fishermen, going into northern waters in search of food for an already poor country,

generally carried a few casks of wine to be disposed of at points along the British coast. They did this not because they made any presumption to being traders, but because they found that wine readily could be bartered on these northern islands for needed provisions. In time regular trade connections were established, and Portuguese wines grew in favor among the English. Port was a minor competitor on the British market, however, until the beginning of the eighteenth century. At that time political foresight recognized a geographic relationship and intervened in Port's favor.

England was embarked on a manufacturing career long before the Industrial Revolution, and was already organizing its markets. In 1703 it negotiated the Methuen Treaty with Portugal, whereby English manufactured goods were to be favored in purely agricultural Portugal, and Port wines were to be given a preferential tariff in Britain. A logical regional exchange was thus arranged, and because of favored entry the consumption and sale of Port increased greatly. Soon this wine was unrivaled in England, because its quality had become as well recognized as its comparatively low price. English firms entered the business in increasing numbers in poor, little-organized Portugal, and a chain of relationships with yearly greater ramifications was begun.

To this day the bases for the trade have remained sound. Industrial England, unlike manufacturing France and Germany, can produce no wine of its own. In agricultural Portugal manufacturing is still in the primitive stage. Hence the Methuen Treaty is one of the few agreements between nations which after two centuries has not become out-moded.

England is no longer Portugal's only customer for the now famous wine, but a surprisingly large percentage of the total exports go to places where the wine was introduced by English. From the mother country the taste and tradition for Port was carried to all of the widely scattered British colonies and dominions, and from the low latitude colonies it was introduced into other portions of the tropics. Moreover, Port, as a British re-export, entered into its trade with Scandinavian countries as well as with Belgium and Holland. As an article of trade today Port is as much English as it is Portuguese. The Port sold in the United States, for example, comes from London.

THE ENVIRONMENTAL BACKGROUND

The English have had a hand in determining the characteristic features of Port production as well as of Port trade, but the individuality to which the wine's success is due can be traced to environmental conditions. Port is in this respect totally Portuguese, for nowhere else are found identical, or even similar conditions.

Port wine is not produced near Porto, as its name suggests, but in the upper (Alto) Douro Valley. The producing district, now lim-

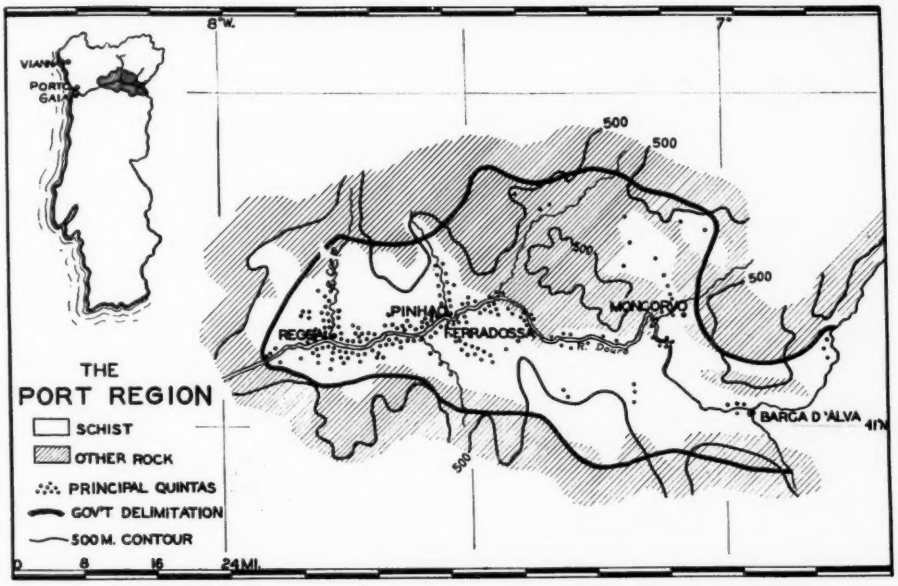

Fig. 1. "Principal quintas" include the properties individually listed on the map of the Douro Region published by the Comissão de Viticultura da Região do Douro, 1932. They usually exceed 25 acres in size and their owners try to manage them more or less scientifically.

The line of governmental delimitation is the one shown on the Comissão de Viticultura map. A detailed survey of the region is now being made for the purpose of delimiting the region even more narrowly, so this boundary will be changed within the next few years.

ited by law, is practically coincident with soils which are residual from an easily decomposed Cambrian schist, and vineyards are limited to lower slopes within that district. The westernmost part of the district lies within fifty miles of Porto, and it extends from there without interruption to the Spanish border. All of the principal producing sections are along the banks of the Douro itself, and have always been closely related to transportation on the river. An old saying runs that the true Port grape is grown only within

Fig. 2. A landscape in the Regoa region, along the valley of a tributary of the Douro. The elaborate terracing, the almost total absence of crops other than the vine, and the paucity of habitation are typical. Altho the photograph was taken on a sunny summer day, the pervading atmospheric haze is a noticeable feature. Collection of the Instituto do Vinho do Porto

sound of the oars on the Douro. This is well demonstrated by the fact that the eastern limit of the Port region long was situated a short distance above the Ferradosa Rapids, the head of navigation on the Douro until 1820. In that year the rapids were blasted clear, and boats were able to reach the Spanish frontier. Aided by the new stretch of water transportation, and later by the railroad, the Port region was extended during the nineteenth century to Barca d'Alva.

A combination of the schist soil, adequately drained slope, local conditions of humidity and sunshine give a high sugar content to Douro grapes. Soils chemically analogous are found elsewhere, as for instance in sections of Spain and Southern Portugal, but under a drier climate; and steep slopes and the same climate are found within the granitic sections of the Douro valley itself, but there the soil gives an inferior wine. The schist region of the Douro has practically a monopoly on its type of wine, whereas almost every other wine can be imitated with some success.

As in the Bordeaux region, in Champagne, or on the slopes of Vesuvius, all of the three environmental elements which influence the quality of wines are of equal importance in the Alto Douro. But also as in other regions they do not exhibit uniformity over the whole district. One would be greatly mistaken in supposing that every part of the Alto Douro region is planted to vines and produces good wine, or that a given property produces good Port grapes every year.

The soils residual from the Douro schists differ widely in chemical composition, and they differ in tilth according to their position on the slopes. Soils high in potash and low in nitrates and phosphates are the most common, but any one or two of these components may have a comparatively low percentage locally.[1] There are, therefore, recognized permanent differences in the quantity and quality of wine that individual properties, or quintas, will produce. The

[1] Analyses of two typical Douro soils give the following percentages of component minerals:

Sample Number	2,439	2
Nitrates	0.39% by weight (dry)	0.25%
Phosphates	0.82	0.25
Potash	5.53	8.94
Lime	1.73	2.20
Magnesium	0.51	2.63
Iron and aluminum	91.02	85.73

Samples taken and analyses made by the Instituto do Vinho do Porto, Porto.

buyer of the best wines refuses to consider the product of many quintas within the legal district merely on the basis of the soil which he knows they possess.

This "ill-balanced" soil as a rule yields comparatively few litres of wine to the hectare, so vineyard owners who seek to augment the number of litres they produce must correct their soils for the elements naturally lacking. The age-old impression prevails in the Douro, however, that the addition of any sort of fertilizer causes an unpleasant taste in the wine.[2] The desideratum of the region is not, to use a phrase which Tennyson ignorantly applied to the Douro fruit, "a rich golden grape grown fat on Lusitanian summers," but a miserably small black one, from which only a few drops of juice can be pressed. That the "poorest soil produces the best wine" has become a regional proverb whose truth is recognized not only by the poorest vineyard laborer, but by the most progressive Porto shipper. Thus when a person hopes to establish a vineyard that will produce wine of the first class, he does not select a gentle lower slope of deep loam, but a steep, rocky hillside, where he literally blasts soil out of stone to make beds for his vines. The freshly decomposed fragments of an immature soil, especially one that is high in potash, give the grape a quality that makes a prized wine. Hence the best wines come from the rock slope around Pinhão and Tua, and not from the gentle hillsides of the much more fertile Regoa region.

Altho all growers share the belief that anything added to the natural soil impairs the quality of the wine, there is always a great temptation on their part to fertilize for greater quantity. The ideal vineyard is one in which vines are planted on a stony soil where they spend their life (20 to 30 years) without the addition of fertilizer, and where, before replanting, a rest period of a few years for the soil is allowed. However, few quinta owners possess enough land or capital to conduct their business on such a basis. Chilean nitrates, Algerian phosphates, and specially prepared corrective mixes are thus on the market for the vineyard owner of moderate means. The poorest owners plant and turn in clover, lupine, or potatoes as cheap sources of nitrogen, and everyone carefully uses the small amount of manure that is available. The residue left after the pressing of the grapes also goes back to the soil. The wine-buyer shakes

[2] This belief was crystallized into law during the years of the eighteenth century when the Marquis of Pombal ruled Portugal. Any Douro grower discovered using fertilizer on his property was liable to fine and imprisonment.

his head at all these practices, but most producers smile when they see three litres of wine where there were two before, and their land in continuous production. But even tho a high percentage of Port comes from vines thus stimulated, famous Ports have never come from properties managed in this manner. It is one of the cases where man has not been able to improve on Nature.

Climate is no less important than soil in its effects upon the

Fig. 3. A well-cared-for vineyard in the vicinity of Pinhão, where the best Ports are produced. The trees in the double row of the left foreground are olives, and they mark a property line in the traditional manner. Collection of the Instituto do Vinho do Porto

chemical processes which take place in the formation of grape sugars. Again the Alto Douro is distinguished, for its climate is quite as individual as its soil. The effective shelter of the thousand-foot walls of the Douro valley produces a climate not only different from that of the surrounding highlands, but also different from the rest of Portugal. Winter rains and a summer dry season characterize it, but the summer is not as completely dry as the southern one, and both winter and summer are considerably warmer and drier than on the northern upland or littoral. Grapes thus have time and ample warmth for ripening, and there are occasional summer rains to refresh the foliage and help fill the fruit. There is no need of such extreme measures as plucking the foliage or throwing dust on the clusters to prevent evaporation of precious moisture, as in drier

parts of the Mediterranean, nor need the Douro inhabitants resort to the production of Vinho Verde, or "green-grape wine," as in Portugal north of the Douro, where because of the cool summer grapes rot before they can ripen. The amount of moisture under average conditions and the quality of the sunlight are ideal for the production of a sweet grape. Typical atmospheric conditions in the vicinity of Regoa bear some resemblance to those of the Bordeaux region in France, where the grapes grown also attain a high sugar content. A typical summer day is hot, but a slight haze often pervades the atmosphere. No day is without sunlight, but the days of continued burning heat which viticulturists fear are rare. Temperatures of over 100°F. are recorded on many summer days because the high valley walls restrict the movement of air. Even a few days of 120° are encountered each year, but one must not assume, as some writers do, a "torrid" summer on the strength of occasional maxima. The diurnal range during summer averages 60°F., and the hours of intense heat per day are few. One sleeps under a blanket at Regoa in July.

Climate varies from east to west in the region, hence wines differ under climatic conditions as well as under those of soil. The extreme western portion of the district is fairly humid, but progressively drier terrain succeeds it on the East.[3] The poorer wines come from the Baixo Corgo,[4] or the humid portion, where there is a little too much rain to produce the best Port grapes. The fruit fills with water and has thus a lower percentage of sugar. The best Port vineyards are found in the intermediately dry region of Pinhão and Tua, where the grapes remain small and sweet, and yet do not dry on the vine.

The differences in humidity are very evident in the practices of cultivation in the two areas. In the vicinity of Pinhão the vines are planted a yard or more from each other, and are pruned rigorously. Every winter a circular trench is dug about the roots of each vine to entice precipitation within the plant's reach. The earth is given two, or even three turnings a season to preserve a mulch, and no inter-

[3] Average annual rainfall:

Serra do Pilar, Porto	44.0 inches
Quinta do Paço, Regoa	36.0
Quinta de Santa Barbara, Pinhão	26.4
Moncorvo	20.3

Observatório Central Meteorológico, Lisbon, Annals of 1934. Papelaria Fernandes, Lisbon, 1935.

[4] "below the Corgo." The Corgo is a tributary of the Douro.

culture is engaged in. Around Regoa practices show little similarity to those of Pinhão. Trenches are seldom dug; the vine is allowed more branch, even tho it is planted closer to another than it would be at Pinhão; one cultivation may do; and cabbages or maize often keep the vines an unhealthful company. Every practice is adjusted to the greater amount of rainful here. More exacting demands on the soil, as well as the heavier rainfall in the Baixo Corgo result in the production of a poorer grape than at Pinhão.

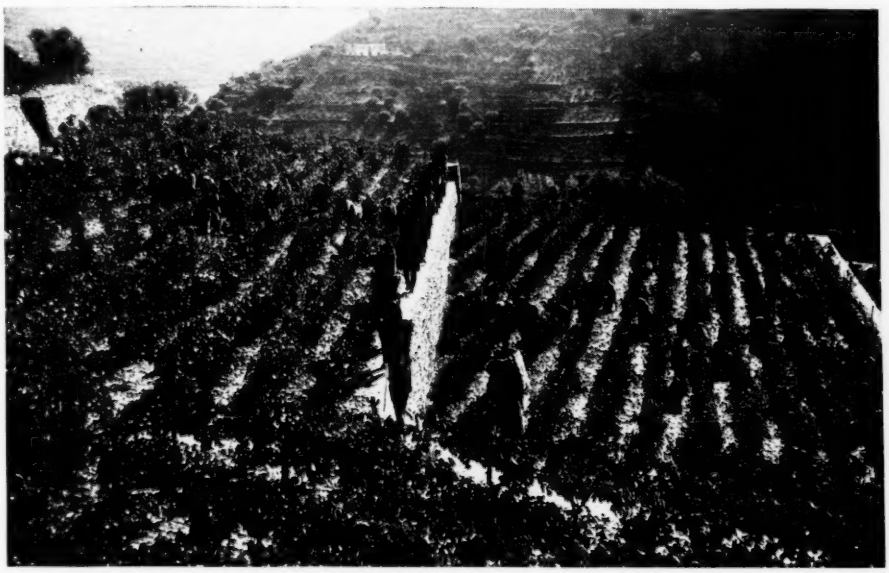

Fig. 4. A vintage scene in the Pinhão region. Most of the workers are uplanders down for the occasion. Women and children gather the clusters, and men transport them to the "lagares," or pressing vats. Musicians traditionally accompany the carriers to lighten their task. Having carried grapes all day, these men will also work all night at tramping, or "pressing" the juice out of the fruit. Collection of the Instituto do Vinho do Porto

A serious problem to the growers in the Douro region comes in the fluctuation of the weather from year to year. One may describe normal conditions, but very seldom is the "normal" approached in any one year, and the range of fluctuation is great. Cold, wet seasons, like the one of 1936, when freezing temperatures ran into June, are likely to succeed hot, dry ones, and vice versa. Or heavy spring storms in an otherwise normal year may strip the vines at the time they are coming into leaf. The probabilities that a given property will produce good wine years in succession are extremely low. There may be, and have been, years without a good wine in the

whole region; there are years when only a few properties produce "vintage" material; and there are years when nearly all the good quintas in the region have vintage wines.

The result of this uncertainty is reflected in the peculiar organization of the Douro wine trade. Because production was, from the first, for a far-off market, which in its ignorance of the vicissitudes in vineyard cultivation demanded a wine of always uniform quality, the practice of blending the wines arose. By blending one means that the wines of a poor year are improved by the addition of varying amounts of wines of good years. It is the one very important contribution of the English to the manufacture of Port, and it is in this task that the art of the Porto wine-taster is revealed. It is his job to combine the many wines that go into Ports, and if he is accomplished he can reproduce identically any one of the advertised types of his company from always different base wines. In a way he overcomes the difficulties of an environment, for he makes saleable certain wines that otherwise would find little market where they are sent.

Fluctuation in the quality of wines further influences the land tenure in the region. The large shippers, contrary to their habit in other wine regions, prefer not to undertake vineyard management, but confine their activities to preparation and sale alone. During bad years or good they are not committed to take care of a given property, but they may buy where they wish, and thus maintain their types as closely as possible. A few of the companies own quintas, but rather than have one large property they have several —located in different parts of the region. If they have chosen varied enough exposures they are thus insured against a complete set of poor wines. But the bulk are small properties of individual ownership, each man taking a risk on his year. In a good one he may "clean up," with his wine at $75.00 a cask, and in the more frequent poor years, when his wine sells at a tenth of that, he may make enough to live on.

Slope, thru its two functions, exposure and drainage, is intimately associated with climate in its effects upon the quality of the Port grape. All of the cultivated part of the Douro region is in slope, an ideal condition for any wine country, because vines demand a quick, efficient drainage for their best development. The slopes are generally steep, so every hillside is terraced—the width of the terrace and the height of its wall varying according to the

pitch of the slope. These terraces are obviously necessary constructions which serve three purposes: first, they keep the bit of flaky soil cover from creeping downhill; second, they catch and make effective use of the precipitation that falls; and third, they keep the water-table at a constant depth.[5] Terracing, however, will not make everywhere a prized vineyard. The terrain near the river has so gentle a slope and so high a water table that terracing is impracticable, while the upper slopes or hilltops suffer from too effective drainage. Port grapes thus come only from the middle sections of the slopes within the vine region. The Portuguese government, anxious to protect a profitable industry, has recognized this fact so far as to promulgate a law prohibiting anyone to label as Port, wine taken from grapes grown below 70 meters or above 500 meters above sea level. One questions the advisability of applying so rigid a classification over so large and so varied a region, but the law points out eloquently the axiom that all the good wine comes from the middle slopes.

Exposure in part compensates for the variability of the climate, for accordingly as they are situated grapes may be perfect or near failures in a given season. Somewhat over half the region has south-facing slopes, and somewhat less than half looks northward. During the first few decades of Port production cultivators felt that the vine was fitted best to a southern exposure in the region, so they limited planting to the northern banks of the river. When the demand for Port grew, however, and the more promising portions of the northern bank were occupied, hardy newcomers experimented on the southern bank. When finally in one of the "dry" years it was recognized that the wine from the south bank was finer than that of the north bank the tabu was dispelled. Ever since the north and

[5] The old "national" vine, which was the one planted almost exclusively before the phylloxera epidemic in Europe, was especially well adapted to terrace cultivation. Its roots grew straight downward and had few feeders. It thus reached the water table and the zone of fresh rock, and altho it fed slowly, it was always taking nourishment.

The phylloxera years were followed by the planting of California vines, which today form the predominate stock. The roots of these vines spread close to the surface, and do not attain any depth. Their tendency is to feed the grape by spurts, and not in the steady fashion of the old vine. Adjustment to drainage is thus not as perfect as it once was, and many say that no really excellent wine has been produced since 1878, when the phylloxera came.

Another effect of the introduction of the California vine has been an increased use of fertilizers. This plant in health demands more of the minor minerals composing the Douro soil than the old vine did. The phylloxera thus has been among the agents helping to break down the dictum about fertilizers.

south bank vineyards have alternated in the production of the best wines of the year. In reality it is not a simple matter of south or north facing slope, but also to what degree the slope may be facing east or west of the dominant alignment. For each quinta on the Port slopes there is a special type of weather best suited to its exposure. That the optimum weather conditions do not occur every year, or even every other year, is obvious. The vineyard planter picks his number and hopes that the wheel will favor him, but like other gamblers, he more often takes a consolation than the grand prix.

Organization of the Industry

The production of Port of average quality is a time-consuming and labor-absorbing process. From the moment when a vineyard is first planned to the time when the bottle or cask leaves the Gaia warehouse, the demands upon manual labor are great. One hardly can accuse the industry of backward technique, for if any shortcuts were attempted the wine produced would not be Port. The construction and maintenance of the thousands of terraces on the steep hillsides is obviously a task for hand work, but even in the cultivation there is no substitute. Every terrace must be prepared, fertilized, and cultivated by hand, and every plant must be pruned and sprayed. The ripe grapes must be picked by hand, and transported on human heads to the vats during the vintage, and even the pressing cannot be done mechanically. The juice must be pressed out in the ancient manner of tramping by foot, because a mechanical press, by breaking the seeds, adds too large a quantity of tannin to the wine.

If one adds the work that is represented in the ten years of tasting, blending, and correction that it takes to produce a mediocre Port, or in the twenty-five to thirty that a good Port requires, and the interest on the investment over the period of aging, a litre of Port should be fairly expensive. If one calculated in North American or even in North European standards, the price would be prohibitive to all but a few.

One of Port's early advantages, however, was the low price at which it could be set down in its market. But at that time not so much care was given to the wine's preparation as now, and the Douro gave cheap transportation that could not be matched by other specialized districts. Nevertheless the low original price of the wine has continued to the present day because of the low cost of its ingredients. The reasons are several, but chief among them are the

extreme cheapness of labor and the tendency of the region to overproduce.

Altho the English and other subsequently acquired markets have been admirably developed, there never has been, for a heavy wine of the Port type, quite market enough to absorb all that might be produced in the Port region. Many practicable vineyard locations to this day are vacant, and so former vineyards stand completely abandoned.[6]

Portugal has many regions where wine is produced, but a relatively limited national consumption. Wine is literally cheaper than good water. Consequently, whenever there was any possibility of profit, vineyard entrepreneurs were lured into the Port region and Douro wines tended to approach other Portuguese wines in their low prices.

In addition few alternatives exist for the quinta owner who finds the price offered for his wine consistently below the point where he can make a decent profit. Olives, almonds, figs, and wheat are other crops adapted to the climatic conditions. Wheat on such terrain would be ridiculous even in Portugal, and almonds and figs are now no more profitable than the vine itself. In the last few years olive groves in the eastern parts of the region have yielded much better returns than vineyards, but olive trees take some thirty years to come into full bearing so they are beyond the means of the average landowner in the region. Everyone feels that olive plantings are made for the next generation, and refers to olives as a "rich man's crop." Hence they are limited to the property lines where they were planted long ago as boundary markers, and every man wishes he had more.

Small holders, as elsewhere in Portugal, are tempted to get the utmost out of their soil and provide themselves with an alternative in interculture, especially that of maize. But what is an apparent gain is always a loss, for the quality of the wine is unfailingly inferior under such conditions.

A few bottoms unsuited to vines become vegetable gardens, and a few orange and loquat trees grow in favored spots, but elsewhere, on lower, upper and middle slopes alike, vines are the only cultivation. The Douro is a one-crop region par-excellence not only because the vine is so well suited to the environment, but because other possible undertakings are by nature more risky than grape culture.

[6] For one reason or another some owners never replanted after the phylloxera had destroyed their vines.

Thus there is little flexibility in production, and without flexibility the return over a period of years is likely to be low.

The owner in the Port zone hopes for a vintage year to bring up his average, but the man who is located too high or too low on the slopes cannot even look forward to that. He relies upon a small yearly return from the sale of his wine for the manufacture of "aguardente," or brandy, which is used liberally in the preparation of Port, or he makes "Douro Claret," which is held in ill repute locally as well as abroad. Brandy manufacture is a regional adaptation to the demand of Port,[7] but the market has been highly competitive, because much other Portuguese wine is also good for nothing but the distillation of brandy, and any brandy can be used in Port making. The profit made by non-Port growers of the region is about the same as that made on a similar enterprise anywhere in Portugal, and the other ingredient of the wine is thus provided at a low price. The fact that growers who can produce nothing but aguardente persist on the Douro, shows how unchangeable is the vine tradition in the region.

If the present profit of the grower is small, the share of labor is even smaller. Altho it is used liberally and exactingly there always has been an unfailing supply at ridiculously meagre wages. Like the entrepeneur, the Portuguese laborer has to consider the competition of all his compatriots. In a land where every-day bread and rice and a weekly portion of fish are the fare, and where peasants in shoes are a rarity, the wage cannot be high. The laborer who has a year-round job in the district earns six to eight escudos (25 to 35 cents) a day. (And the eight-hour day has not yet been heard of in rural Portugal!) Seasonal laborers accept even less. The neighboring province of Beira and Tras-os-Montes, among the poorest districts in poor Portugal, send down eager hordes during vintage or cultivating time. When, a few years ago, the scale of the Galician was even lower than that of the Minhoto or Beiran, seasonal labor came across from Spain. The cheapest hands to be had always seem to appear in the Port district.

The lot of the laborer also might be a better one if there were any other activity in the immediate region to give scale. But the proletarian opportunities in the Douro region are limited to that

[7] Port contains about five parts Douro wine and one part aguardente. The brandy originally was added to enable the wine to carry in shipment, but now it serves the triple function of strengthening it, permitting it to be carried, and arresting fermentation (to preserve the wine's natural sweetness).

of cultivating the vines and loading the wine into the little boats that go westward on the river. Every cask goes directly down the Douro from the quinta to Vila Nova de Gaia, where most of the elaborate treatment of the wine is done. All of the warehousing activity, the preparation for foreign shipment, the manufacture of barrels, and such activities take place at Gaia and Porto. The towns of the region, because of their atrophied functions, are little more than villages. They harbor no industry, and have a minimal relation

Fig. 5. A loaded "rabelo" bound upstream on the Douro. The long tiller is essential in navigating rapids when the boat is going downstream, for a quick response to its rudder often saves a boat from going on the rocks. When the wind fails on an upstream trip all of the numerous crew are needed to tow the load. Collection of the Instituto do Vinho Porto

to the quintas. The opportunities for a worker are thus exceedingly limited in the region itself, and his remuneration suffers from local as well as more remote influences.

The one remaining factor in the low price of Port is that of transportation. Since the 1880's a railroad has run the length of the Douro valley, so the picturesque sailboats no longer have a monopoly on the trade. But they still exist. In fact one may see tens of the oriental-looking "rabelos" pass Regoa every day, laboring upstream against the stiff current, or gliding swiftly down. The railroad has not been able to improve upon the rates offered by the

boats, so the two now share the trade. Quintas located on the railroad's side of the river habitually use rail shipment, and those across the river use boats all the way to Gaia in preference to ferrying, then transshipping to rail.

The rabelos have remained a commercial proposition for two reasons; first, because of the low wages of the men needed to operate

Fig. 6. Casks of wine on the way to a river landing. The common method of local transportation in the Douro is by ox-cart. The strange head-pieces take the place of the "cangas" or yokes which are used elsewhere in Portugal, because in this hilly region a yoke about the neck of the animals would choke them. With the head-piece the thrust of the load is placed entirely on the horns. Collection of the Instituto do Vinho do Porto

them; second, because natural conditions enable them to make quick trips without the use of auxiliary power. During winter and spring, when shipments of new wine are made downstream, the river is high, the current strong, and the wind from the east, so loaded boats soon reach their destination. During the summer months, when the current is slack, and when west winds blow frequently into the lows of the Spanish Meseta, the heavier loads (return casks) are carried

upstream under sail.[8] When the winds fail the crews take to the towpaths constructed along the stream, for next to the wind men are the cheapest method of locomotion.

Somewhat less than half the wine shipped goes on the river, but the quantity is large enough so that one correctly may assume that river navigation has kept shipping rates low.

The importance of the low cost of production cannot be exaggerated. The fact that Port firms, because of low wages, small profits, and cheap transportation rates, can buy their wines at comparatively low prices becomes a cumulative advantage. The investment is low, and the carrying cost of interest over the long period that the wine must be stored and treated is also low. When his product is finally ready for sale the Porto shipper is in a position where he could undersell any possible foreign imitator, even if it were found that Douro wines could be successfully reproduced elsewhere, as for instance in California. As it is he is able to compete favorably in the broader market for all fortified wines, and he undoubtedly takes a share of that trade that would not be his under different circumstances.

THE OUTLOOK IS NOT BRIGHT

With all of their present advantages, however, the commercial prospects of the Porto shippers are not very encouraging. They have not been good during the decade. Wine is a luxury in any but its most crude forms, and as such it suffers not only increased taxation but decreased consumption in times of economic stress. Thus in recent years the Porto firms have seen prices mount with no benefit to them, for they have been absorbed in foreign and domestic liquor taxes, in tariffs, and in Portuguese taxes on industries.

The situation in England, which has been and still is the principal market for Port,[9] is an especially trying one. Middle class

[8] Statistics of the Observatório Central Meteorológico, Lisbon, show that west winds are three times more frequent than any other wind in the Douro region in the period from April to October. East winds have a like preponderance in the winter months.

[9] The 1935 exports were divided in the following percentages:

England	48.2 %
France	28.0
Norway, Sweden, Denmark	9.8
Belgium and Holland	5.25
Germany	2.25
Brazil	1.1
United States	0.7
Other countries	4.8

families which used to keep cellars well stocked with the best Ports now are constrained to buying seldom and poorly, partly because they now live in cellarless apartments, and more because they no longer have the means to buy with. Coupled with this has been an inducement to buy "Empire" wines, because the agreements of a few years ago accorded them even more favorable treatment on the English market than the Portuguese had. Port firms at the moment are struggling against odds in England, where the last few years have seen a notable diminution of comsumption.[10]

France, one of the great wine producers in the world, paradoxically has been the second consumer of Port. But in France there is even less room for hope than in England. Port wines now enter France by quarterly quotas, which promise to be lessened rather than augmented. Frenchmen now find an increasingly large range of aperitifs which use national wines, not Port as a base. As the adjustment to internal supply becomes more perfect Port wine will be more excluded.[11]

Brazil, which has an important Portuguese population, and consequently is a market for a surprising number of Portuguese products, used to consume a large amount of Port prepared as quinquina and vermouth. It was once the third best customer Portugal had for its wines. Now, however, the necessity of bargaining for trade has also introduced the quota idea, and Port finds competitors in wines like French Burgundy. Brazilian imports have declined strikingly in the past few years, and shippers seem pessimistic about retrieving their lost trade.[12]

Just as great have been the declines in the German market, where Port was one of the first things for which "ersatz" could be found, and in other quarters, if there is less room for pessimism, there is little more for hope. The Scandinavian countries and the Netherlands now operate on strict quota bases, and the miscellaneous markets were long ago developed to their peaks.

Of the sales in miscellaneous markets about three-fourths are made in the tropical regions, where strong wine finds favor among those who consider alcohol an antidote for the lassitude occasioned by monotonous heat. The sales are in small quantities and among a widely scattered clientèle, but they contribute an appreciable increment to the trade, and promise to continue constant as long as

[10] British import, 1929: 27,765,300 litres; 1935, 18,477,614 litres
[11] French import, 1932: 16,886,930 litres; 1935: 10,714,969 litres
[12] Brazilian import, 1929: 1,989,080 litres; 1935: 373,295 litres

white people remain in the equatorial lands. The English and Portuguese colonies, where the people have a tradition for the wine, are the most important of this group of buyers.

Portugal itself does not figure noticeably in the list of consumers of Port. Of the 38,000,000 litres sold annually it is estimated that about 700,000 (1.8%) are taken in Portugal. Not only is the country so flooded with wine that the small amount of Port produced is scarcely noticeable, but it is much too poor to buy the carefully prepared product that finds a market on the outside. The nearest that the average Portuguese comes to tasting Port is in drinking the aguardente that is prepared from the remains of the grapes already pressed to make wine. Until the price of Port approaches that of other local wines Portugal will be the poorest customer for its own product.

The future thus promises neither growth for the firms which trade in Port nor great prosperity for the region which depends on their organization. One can see small hope for the expansion of the present output because any increase in the present insignificant trade to our own country[13] will be amply compensated for by losses in other countries. There is little chance that the present poor standard of living will rise, or that the area of vine cultivation will appreciably increase. A gradual diminution of vineyard acreage is more likely—resulting not only from economic pressure but from an avowed policy of discouragement by the Portuguese government, which has undertaken to regulate the amount and the quality of the wine produced. The overproduction problem momentarily has been solved by the Casa do Douro, the supervising body, by arbitrarily limiting the amount of must that can be treated as Port. In 1934 and 1935 27,500,000 litres were treated each year. When one compares this with the exportation, which totalled approximately 38,000,000 litres each year, he sees that stock depletions promise better prices in the future, and somewhat higher profits to those who are fortunate enough to remain.

Higher prices must not be interpreted as meaning prosperity for the Douro, for two-fifths of the former producers of Port have been excluded from the sale of their wines by the arbitrary limitation,[14] but they still remain in the region. The fortunate few whose quintas remain Port quintas will improve their positions, but the now more numerous producers of aguardente and Douro Claret

[13] Import into the United States, 1935: 252,736 litres

[14] Total production in 1929: 45,000,000 litres approximately

will be worse off than before. No amount of limitation can improve the status of the group as a whole. The Port industry is somewhere between a static and a declining state.

A Major Industry in Portugal

Even if its position is declining relatively, the manufacture and export of Port wine remains one of the most important activities in Portugal. It is one of the country's most valuable manufactures, and it furnishes easily the largest export from a nation which has difficulty in maintaining its trade balance. Sardines and cork help to pay for the imports of dried cod that Portugal eats, the cloth that it wears, and the coal that it burns, but Port bears by far the greatest part of the burden of making exports and imports balance.[15] Portugal introduced itself centuries ago into the European trade world with Port, and its problem at the very moment seems to be that of keeping its imports down to what Port can pay for.

Port's influence has not ceased with its simple addition to the trade balance sheets. Its indirect effects upon the economic life of the country have been no less striking than its preponderance in the export trade. Foreign capital was first enticed into Portugal for the development of the wine industry, because Portugal had little of its own, but once comfortably settled there its spread into other branches of Portuguese commercial activity was inevitable. Thus one finds English, French, and Belgian investment in every corner of the Portuguese economic structure. From its beginnings in the wine trade foreign money found out cork and resin, it developed mines, built factories and railways, and installed every public utility in Portugal. Outside capital undoubtedly would have discovered Portugal without Port's introduction, but the process of development would have been considerably delayed in this remote country of little indigenous resource.

More evident and more impressive is Port's influence upon the life of Northern Portugal. Porto, little before the wine trade began, is now one of two cities in the country. The shallow harbor of the Douro estuary and the treacherous sand bar which guards its mouth

[15] Exports from Portugal, by value, 1933:

Wine	$8,641,575.00
Fish	5,569,875.00
Cork	3,823,830.00
Cotton Goods	2,113,695.00
Fruits	1,725,435.00

Statesman's Yearbook, 1935

were designed not to attract ships, but to keep them away—as indeed they did until it was found that Porto harbor was the most convenient point for loading the sought for wine. The city's future was determined from the time that the first casks of Port left it, for it was assured a monopoly on the export of Douro wines by its position at the mouth of the river. Its activity was not limited to a regulation of the wine trade, however, because as the point of loading Port it became also a place for unloading ships' return cargoes. Porto, the former fishing village and ferry landing, became an entrepôt. Not only were barrels and other articles needed by the wine firms landed there, but increasing quantities of English textiles manufactured metals, machinery, and coal. O Porto was indeed "the port" for northern and central Portugal.

In time suggestion prompted the establishment of factories to turn out some of the articles which hitherto had formed the return cargoes. Portuguese cooperages now turn out the formerly imported barrels, as one certainly would expect, but factories for textiles and metal goods, inspired by the imported patterns and aided by the incoming fuel, have been started and are expanding in the vicinity of Porto. Importing houses found the establishment of Portuguese factories only a logical step, and goods are now being manufactured which might have been introduced only recently had it not been for Port.

One can follow the influence of the wine exporting industry upon Portuguese economic life further and onto more controversial ground. There is no need of that, however, to convince one that Port has made significant contributions to the national wealth of its homeland, and that it has kept it in contact with the world. Portugal in some measure may be consoled for its striking lack of the resources upon which modern civilization is founded, by its possession of the spot of soil and climate which produces its famous wine. It is very fitting that "Port" commences the name "Portugal."

AN APPROACH TO MAP STUDY

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"Can geography be taught as part of social studies?" This is a question often raised. Perhaps a report of how one group began to learn about maps will be a help in answering it.

It is the responsibility of the lower grades to see to it that children's original exposure to maps is so real and clearly understood that work with them afterwards will be a pleasure. Our work in social studies, centering around a study of our own community, offered an excellent opportunity for a beginning in this study. This was third grade, so few of the children had yet taken any interest in maps, tho a few knew something about automobile road maps.

Since the children came from all sections of the city and suburbs we began by trying to locate their homes in relation to the school. With chalk on the classroom floor the children started a very simple map. They drew the streets around the school and a few of the main streets leading down town and to the suburbs. From clay they made tiny models of their own homes, painted them, and using these main streets as guides, placed their homes about where they thought they belonged. This took many days as most of the children were brought to school in cars and had not noticed what streets they took, or in what directions they had driven. Many children had to be reminded day after day to notice street signs and right or left hand turns before they could finally trace the route with a tiny toy car on the map, and place their homes correctly. Since this was all quite new, we made directions on the map correspond with actual directions.

Finding out more about our community led to several trips. The first of these was to a near-by lighthouse, from the top of which we had an excellent view of the harbor, coast line and vicinity of our school. Several additions to the floor map were made as a result of that trip and others to such places as post office and fire station. As experience in noticing streets grew, the children realized they would need to make several changes in their map; buildings had to be moved, streets erased and put in better relationship. By this time they had covered the chalk lines with white poster paint so that the buildings could be picked up every night and the floor swept without having the lines destroyed, but even these lines were readily washed off if changes were necessary.

For several weeks the work carried on in this way, with all streets going on by guesswork,—this building was about here, that street about there. Only when, inevitably, arguments arose as to the placing of things, did it seem wise to begin to discuss scale. Several of our group walked to school from North Avenue and knew that it is a mile, so we measured that distance and found that we were using two feet to a mile. The next point was to see how nearly the rest of the map fitted that scale. To check on this we planned together a trip down town and around a large square back to school, about ten miles in all. Each child took a pencil and a paper telling what distances we wanted to measure, and in groups of four or five to a car with fathers and mothers acting as chauffeurs, we set out. At each of the main streets that we had on our map the cars stopped while the driver helped the children figure out from the speedometer how far they had been since the previous stop. Back at school again the class enjoyed checking on their map and erasing when necessary. Surprisingly few changes had to be made, but now there was no need to argue. It was fixed to everyone's satisfaction. After that the children measured distances whenever they went on an excursion so that new streets and buildings could be accurately placed.

Later one of the children complained because his home was so far away it couldn't be placed on the map, and he did wish we could make one on a smaller scale so there would be room for it. A group decided to try it in another part of the room using only one foot to a mile. They found it was quite a simple thing to do. This time it was drawn on brown wrapping paper and for the first time we discussed directions. One child knew that we needed a "thing like a compass" pointing North, so he drew it in the corner of the map, using a real compass as guide. Then we picked the paper up and turned it different ways, finding that with this sign as a guide it could be turned any way and still be accurate. It was called to their attention, that altho North is usually at the top of a map, it is not always so, and one needs to look for the compass sign.

Everything so far had been group work, and only after this much had been accomplished did we try individual maps. Each child then decided what scale he would use for his own map, most of them choosing one or two inches to a mile. By this time they were so familiar with the distances they had measured on their trips that there were very few who needed any help. Many children went ahead putting in more streets than we had used on the floor map. Then *for the first time* the group was shown a map of the entire city.

Reading it then was easy, and fun, too. By this time the idea of scale had sufficient meaning for them so that measuring on any map was not too difficult. In fact, finding distances between places on the big wall maps became a popular pastime.

It should be made clear that all this map work covered a period of many weeks during which the class was finding out much more about the community than just how the streets lie. The slow growth of the big map during our visits to dairy, ice cream factory, pumping station, etc., was the factor that made it real to the children. They were never told where to put a street or building, or corrected except by each other if mistakes were made. It all grew from first hand experiences. Toy cars and trains on the map made it an interesting play center and much of the learning of streets and directions was incidental to this play. The entire experience proved to be a satisfactory way of helping children to understand maps, and of emphasizing the geography side of the social studies program.

A HUNDRED YEARS AGO GEOGRAPHY WAS TAUGHT "EVEN TO FEMALES"

The following amusing paragraph is from the introduction to "A Modern Atlas," by John Pinkerton, published in 1818: "Geography is a study so universally instructive and pleasing that it has, for nearly a century, been taught even to females, whose pursuits are foreign from serious researches. In the trivial conversations of the social circle, in the daily avidity of the occurrences of the times, pregnant indeed above all others with rapid and important changes, that affect the very existence of states and empires, geography has become an habitual resource to the elegant female, as well as the proud philosopher."

CONSERVATION IN UTAH, A SEMI-ARID REGION

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Nationwide attention has been called to the lack of conservation in our semi-arid regions. From time to time suggestions have been made as to the proper use of these areas of light, unreliable rainfall, but it has taken disastrous floods, great dust storms, wide destruction of fertile lands and large-scale movements of people from these regions to bring a realization that their use should differ from that of more humid areas, and that solutions to their problems also will differ materially.

Our semi-arid lands may roughly be located as lying west of the 100th meridian. Not only all of the Great Plains are a part of this vast semi-arid domain but much of the Colorado Plateau and the Great Basin are also included. The state of Utah has an average rainfall of about twelve inches, and at least half of the state may be classified as semi-arid (Fig. 1).

Conservation carries a different meaning in various parts of the country. A resident of the South thinks of land drainage, flood prevention, and soil erosion work. In the north-central states it probably is definitely associated with the reclamation of cut-over lands; on the plains, with restoration of plant cover. In the semi-arid regions of the Great Basin, the term means saving and increasing the water supply.

Bernard De Voto has said of the West, "in the end as in the beginning, a dry land so that all problems returned to the master problem of how to get enough water on land for which there could never be water enough."

INCREASING THE AVAILABLE SUPPLY OF WATER

Water, there, is the greatest natural resource. Only in the mountains, otherwise unsuited to agriculture, is the rainfall sufficient for crop production. Elsewhere, agriculture is entirely dependent upon special farm practices, such as irrigation and dry-farming and even these methods of farming are entirely dependent upon the water supply. Of vital importance, then, are measures which deal with the efficient use of the present water supply or plan to increase the amount available.

The proposed increase in amount of available water will not directly conflict with the Government's attempt to limit crop pro-

duction. Some will be used to maintain municipal supplies, some to stabilize power production and some to furnish supplementary water to land now receiving insufficient amounts or to lands without water, lying within irrigated districts.

There are several ways in which this supply may be increased, among which are the following proposed plans.

1. Better Methods of Irrigation. The unprecedented water shortages during the last few years have resulted in improved methods of using water and greater cooperation among users. As early as February, 1934, it was recognized that Utah was facing a very serious drought. Largely as a result of excellent cooperation among the water-users, in many areas of the state, normal or nearly normal crops were produced that year, and in other areas considerable forage was raised.

Some irrigation methods which conserve moisture are: (1) storing all water and postponing irrigation until moisture requirements of the soil demand it; or if storage facilities are not available, practicing early spring irrigation and filling the soil to its maximum capacity, thus using the soil as a reservoir; (2) running the early flood waters over the gravel-beds above the ground-water basins in those regions where pumping is practiced; (3) removing weeds and cleaning ditches and canals early in the spring in order to prevent undue loss from seepage; (4) rotating the use of the stream and having a shorter irrigating period rather than using a divided flow a longer time; (5) planning a cropping system that fits the probable available water supply in regard, both to amount of water and time available, thus avoiding the planting of late crops when late season water is not available.

2. Diking Utah Lake. This plan for conserving available water is unique in that it proposes to reduce the capacity and area of an existing reservoir in order to increase its annual yield.

Utah Lake, a small fresh-water lake in the central part of the state, has been compared to a huge shallow evaporation dish. Water evaporates from the lake at an average of nearly 4 feet a year. In years of low run-off as much as 75 per cent of the total inflow to the lake is lost by evaporation, leaving only 25 per cent available to canals which divert water from the lake. In order to reduce the large evaporation losses a dike 5½ miles long is to be built cutting off the southern arm of the lake. The water saved will provide an additional water supply for about 50,000 acres of land already under irrigation in Salt Lake County.

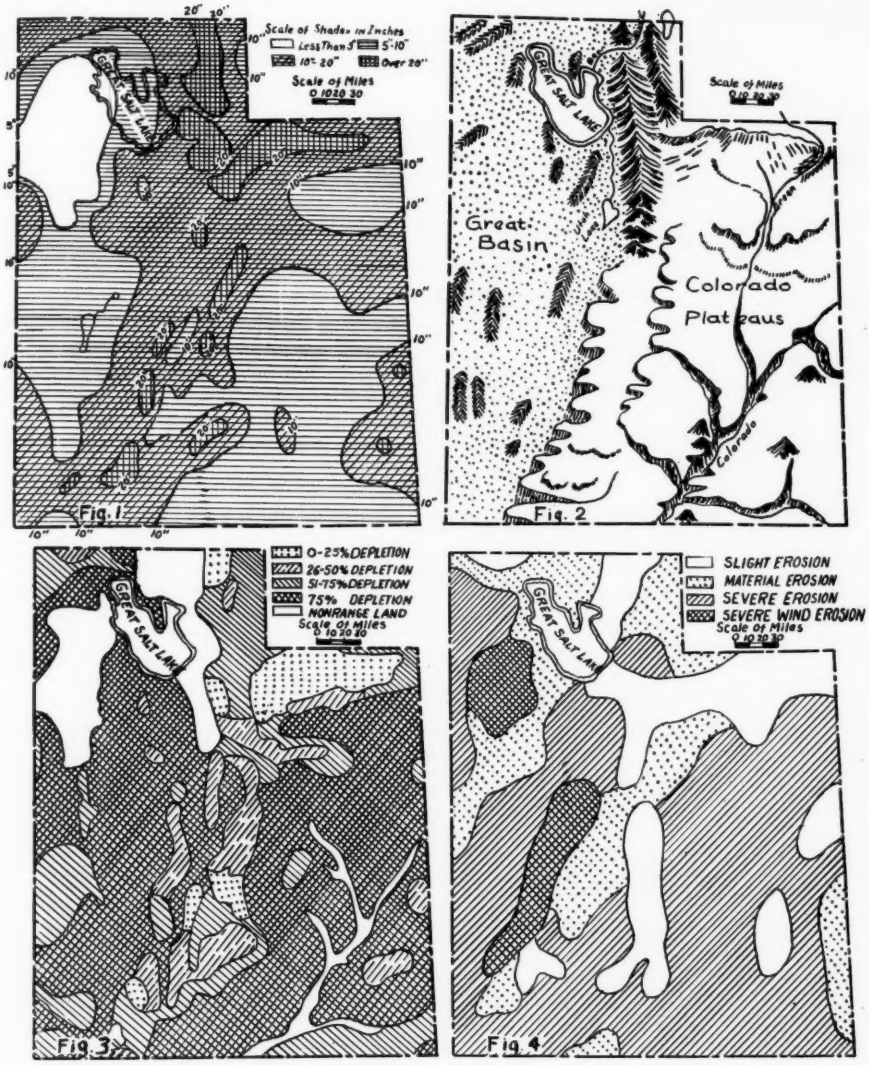

Fig. 1. Rainfall map. From map by U. S. Weather Bureau

Fig. 2. The Two Drainage Basins in Utah. (After Physiographic Diagram by A. K. Lobeck.)

Fig. 3. Forage Depletion on the Present Range. Courtesy, U. S. Forest Service

Fig. 4. Erosion on Utah Range Lands. Courtesy, U. S. Forest Service

3. Diking Great Salt Lake. In order to secure an adequate supply of water for industrial use and perhaps add a supplementary supply for irrigation it has been suggested that a dike be built across Great Salt Lake changing part of the lake into a large fresh-water reservoir.

Two plans for such work have been presented. The larger project contemplates the building of dikes about 12½ miles in length, connecting the southern shore, two large islands, and Promontory Point, isolating about 430 square miles of water which would be freshened in a period of about five years by water from Bear River and the Wasatch Mountains. The smaller project would barricade only the southeast portion of the lake, comprising approximately 146 square miles, and divert to it the flow from Weber River. In either case the water in the reservoir would be maintained at a slightly higher level than in the salt lake and the heavier salt water, probably aided by pumps, would pass thru submerged gates into this lake.

Because the water supply in Great Salt Lake is insufficient at present to supply evaporation and to keep such a lake filled, this plan has not been carried out.

4. Diverting Water from the Colorado River Basin. The state of Utah is naturally divided into two almost equal areas, the Great Basin at the west, and the Colorado Plateau System on the east (Fig. 2). The narrow fertile strip lying just west of the Wasatch Mountains and Plateau Escarpment contains the larger part of the irrigated area of the state and most of the people, but has a limited water supply. The Plateau area of higher elevation and broken relief, crossed by deeply-intrenched streams tributary to the Colorado River, has a small population but ample water supplies. Therefore, it would seem advantageous, if possible, to divert this unused water from the Colorado River drainage basin into streams which would carry it to the more densely populated oasis west of the mountains. This would occasion no conflict with the Colorado River Compact, where 7½ million acre-feet of water were allocated to the four upper states, New Mexico, Colorado, Wyoming, and Utah. If Utah is to use any considerable portion of Colorado River water, it must be thru diverting it from the Green River drainage.

Such a diversion is made already by the Strawberry River Development, where water from the headwaters of this river, tributary to the Colorado, is carried under the mountains thru a tunnel over 3½ miles long and turned into the Provo River which finally reaches the densely populated oasis. It is now proposed to build a second tunnel 5½ miles long to divert water from the North Fork of the Duchesne River into the Provo River.

Another proposed diversion of Colorado Drainage water has

been suggested as feasible in Wyoming, where water from the Green River would be diverted into the Bear River which furnishes water for irrigation in the three states of Wyoming, Idaho, and Utah. Lands along this river have been brought to a high state of cultivation producing, in addition to alfalfa and hay, such specialized crops as sugar beets, peas, potatoes and fruit.

Other proposals for diversion from one basin to another have been made and one such project, now nearing completion, carries water thru a tunnel under the Wasatch Plateau from the Price River basin for use in central Utah.

5. Regulating Use of Underground Water. Prior to 1935 there was little regulation of underground water, which furnishes an appreciable supply of domestic, irrigation, and municipal water in the state. No attempt was made to limit the number of wells drilled, even when the supply of water was over appropriated and the drilling of new wells interfered with the flow from old wells. Considerable litigation resulted. With this lack of regulation the flow of most wells has decreased and hundreds require pumping or have entirely ceased to flow. In some instances entire groups of small artesian wells which were used chiefly for culinary and stock-watering purposes have gone dry because large wells pumped for irrigation purposes have recently been sunk in the area.

In an effort to remedy this situation the 1935 legislature enacted an amendment to replace the present water law stating that "all waters of the state whether above or under the ground are declared the property of the public and subject to all existing rights to the use thereof." This law made ground water in Utah subject to the same laws of appropriation, distribution, and adjudication as surface waters, with regulation of their use vested in the State.

6. Forecasting the Water Supply by Snow Surveys. In order to be able to determine the amount of water which probably will be available for the succeeding irrigation season, snow-survey work on the higher lands of the western states should be carried on during the winter months.

It has been estimated that on the high watersheds of Utah from 60 to 90 per cent of the total precipitation falls as snow which accumulates during the winter months and furnishes the run-off during the period of low precipitation in summer. Approximately 80 per cent of the stream flow comes from about 20 per cent of the area of the state which lies at an elevation of 7,000 feet or more.

The late summer flow, upon which depends the amount of land which can be irrigated, is most valuable. Fifty snow courses have been laid out by the Agricultural College Experiment Station and measurements made about the first of April each year form the basis for forecasts. Such forecasts at the beginning of a season are of untold value. Farmers, stockmen, municipalities, water companies, power plants, etc., can plan for the summer. When advance knowledge of a threatened water shortage is available, plans for storage or conservation can be made, and supplemental supplies may be developed.

7. Controlling Small Streams. The importance to the physical well-being of the people of the United States of the proper treatment and use of headwater and other small streams is only just beginning to be recognized. Remedial measures should plan for conservation work where the rain strikes the ground, at the source of the rivers.

Small streams in a semi-arid region gather the precipitation from the higher watersheds and carry it to the more arid but fertile farm lands in the valleys below. Most of the streams are small, relatively short, with steep gradients and little room for run-off storage. These streams are snow-fed and during their peak flow which occurs during May and June they carry from 5 to 25 times as much water as during their low-water flow from July to September. Water from these small streams is used for irrigation, power, and municipalities. The entire low-water flow is utilized but frequently the spring high water is wasted.

Storage reservoirs, stabilizing and protective structures are offered by upstream engineering to mechanically control these small streams so that the natural flow is equalized, the soils on the watersheds are stabilized, and protection is given against floods along stream channels. Where sites are available storage reservoirs very effectively equalize stream flow. Investigations for the purpose of finding such sites in Utah have recommended 88 as feasible sites. Cost estimates have been made and work has started on some of them.

RESTORATION OF WESTERN RANGE LANDS

Second in importance only to the necessity of conserving water is the need for the conservation and wise use of range lands. The western range has never been recognized as one of the great natural resources of the country. Not only its value but the consequences of neglect and abuse of these lands have been quite overlooked.

Range depletion (reduction in grazing capacity) for the entire area of range land in the United States averages over 50 per cent, being greatest on the public domain, and least on the national forests.

In June, 1934, the Taylor Grazing Act went into operation "to stop injury to the public grazing lands by preventing overgrazing and soil deterioration, to provide for their orderly use, improve-

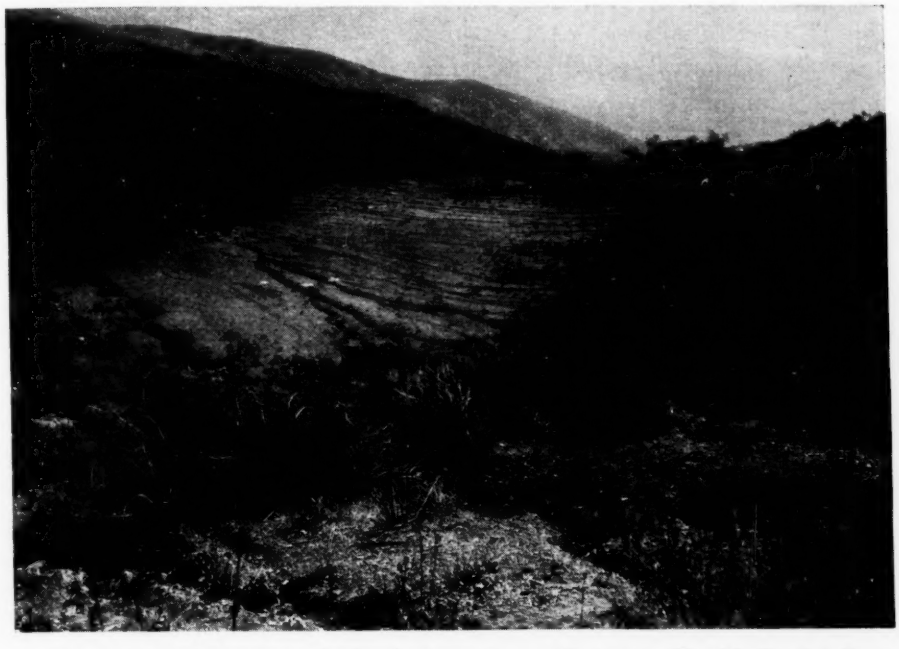

Fig. 5. Eroded area near the headwaters of a small stream. (Parrish Creek.) Overgrazing of this area resulted in floods at the mouth of the canyon. Courtesy, U. S. Forest Service.

ment, and development, to stabilize the livestock industry dependent upon the public range and for other purposes." About one-half of the public domain (or some 80 million acres of range lands) was placed in grazing districts which are being supervised by the Department of the Interior. An amendment to the bill, now pending, contemplates the inclusion of an additional 63 million acres.

With the exception of a small amount of land located west of Great Salt Lake, all public domain of Utah (nearly one-half the total land area of the state) has been placed in nine grazing districts. Range lands of the state with 50 to 75 per cent depletion are severely eroded (Fig. 3). The Drouth Range Administration has already spent some $310,000 developing spring water and has sunk 48 wells in the western part of the state. As yet no reseeding of

ranges has been carried on, but CCC workers are building trails and fencing lands. Cattle are confined to certain areas, but sheep, because they have a herder, are allowed to spread out, in some places going into two or three districts.

Control of the western range will eventually result in restoration of ranges to their previous carrying capacity. It is estimated, however, it will take 50 years to make the range capable of carrying the 17.3 million livestock units now found there and another 50 years to render it capable of supporting its original capacity of 22.5 million units.

CHECKING ACCELERATED EROSION

Not only has overgrazing depleted the resources of the western range but this destruction of the vegetative cover has resulted in severe erosion and destructive mud flows (Fig. 4). Available data have shown that the most important factor in affecting erosion and run-off is not slope, but the character of the vegetative cover and soil. Adequate proof is available to show that small overgrazed areas in the high watersheds have caused floods which destroyed farm lands and buildings in several parts of the state (Fig. 5). Experiments carried on by the Forest Service show the beneficial results of proper grazing or temporary non-grazing of areas.

Fig. 6. Farm lands devastated by mud-rock flows. (Parrish Creek north of Salt Lake City.) Courtesy, U. S. Forest Service.

The steep mountain streams of the Rocky Mountains present a peculiar problem for control. In recent years during heavy summer storms many of the mountain streams of northern Utah have been subject to disastrous mud-rock flows which carry sand, gravel and huge boulders, from the narrow canyons out on the alluvial fans in the valleys, filling ditches, burying roads, fences, and fertile fields, and destroying buildings (Fig. 6). It is the great load of debris rather than the large amount of water which makes the control of such flows difficult. To check such a flood, barriers or dikes

Fig. 7. A series of terrace-trenches. Courtesy, U. S. Forest Service

are built across the stream to spread the water as it emerges from the canyon, a spillway is constructed to take care of the surplus water and a stilling pond is placed lower down where the finer material may settle.

Such measures should be regarded as temporary remedies only. Each storm carries debris into the basins so that the walls must constantly be built higher or the basins cleaned out between storms. Permanent control of such small streams in semi-arid regions is dependent upon revegetation of eroded areas in the high watersheds.

Where serious erosion is taking place on steep slopes, trench

terraces, which serve as small reservoirs, are built, thus delaying run-off, preventing floods and aiding in soil stabilization and revegetation (Fig. 7). A series of contour trenches ascending the steep slopes in a series of steps are constructed about 25 feet apart. When completed they are seeded to grasses and weeds, and trees are set out at regular intervals. These terrace-trenches are considered the most effective means of controlling run-off and erosion of the headwaters of steep mountain watersheds.

One of the largest conservation projects now carried on by the Federal Government is the rehabilitation of the Navajo Indian

Fig. 8. Accelerated erosion in one of the valleys of the Colorado Plateau. (Kanab Creek, southern Utah.) Courtesy, U. S. Forest Service.

Reservation. These high plateau lands of southeastern Utah, northeastern Arizona and northwestern New Mexico support a growing population which now numbers about 45,000 Indians. Overgrazing has resulted in accelerated erosion which has washed away fertile fields, and lowered the water table. To prevent the concentration of water in the larger streams, diversion dams and spreading works have been built and on the headwaters upstream engineering devices such as check dams, gully plugs and terrace-barriers.

Accelerated erosion is rapidly carrying to the sea, fertile farms in other parts of the Colorado Drainage Basin (Fig. 8). Alluvial deposits laid down when streams were aggrading have been deeply

cut or entirely scoured out. The seriousness of the situation is shown by the decline of Bluff, Utah, located on the San Juan River. This town, once said to have the greatest per capita wealth of any town in the United States, has been reduced from a prosperous town of 600 to a tax-delinquent community of 50 persons. Overgrazing has reduced the carrying capacity of the range and the river has carried away one-half the agricultural lands.

These fertile farms formed part of the greatly increased load of silt carried by the Colorado River to harass engineers at Boulder Dam and to form a problem of interest to Los Angeles water-users. Elwood Meade in speaking of the Colorado has aptly described the river when he said, "It is too thick to drink and too thin to plow."

PURCHASE OF SUB-MARGINAL LANDS

In the intermountain area some of the finest range lands were plowed for dry-farms. Part of this land was entirely unsuited to cropping, and many of the dry-farmers are now on county relief rolls. In order to relieve their distress, remove the menace of dust storms and floods, and finally to return this sub-marginal dry-farm land to range use for which it is best suited, the Federal Government is buying this land or exchanging for it more desirable farm lands elsewhere.

The rehabilitation of these lands will be painfully slow. Shantz estimated that it required from 20 to 50 years for short grass to be reestablished in eastern Colorado and that in some areas it might require 100 years for the return of the native vegetation. After land has been plowed in Utah it is covered with weeds such as Russian thistle, mustard, sunflowers and niggerhead. Later, sagebrush returns and, still later, the more nutritious bunch grasses, weeds, and browse plants. Artificial reseeding sometimes helps but is expensive and usually less satisfactory than natural revegetation. However, it is absolutely necessary that some plant covering is developed, no matter what it is.

There are two Resettlement Administration Land Purchase Projects in Utah. In both regions dry-farming has been tried but their scant average rainfall of only 11 inches is usually not sufficient for profitable dry-farming in Utah.

The Widtsoe Land Use Adjustment Project comprises some 30,000 acres in Garfield County in the southcentral part of the state. The short growing season (the elevation is over 7000 feet), and long distance from market make it an area unadapted to crop production. It is best suited for grazing, but the farm units of 320

acres are so small that cattle raising is not profitable. The land is to be removed from cultivation and added to the Powell National Forest as a grazing subdivision. This will reduce the fire hazard in the forest, permit the raising of supplementary winter feed for livestock, prevent floods which occur during the period of high water, and provide a much needed lambing-ground and valuable grazing lands.

The Central Utah Dry-Land Agricultural Project comprises about 40,000 acres of land in a small valley at the south end of Utah Lake. In addition to insufficient rainfall the problem here is that of a light sandy soil too poor, or too run-down, to support dry-farming. It is intended to return this crop-land to grazing use also, in order to make the land productive again and to remove from the surrounding region the menace of periodic dust storms. The two projects will effect the removal of about fifty families.

Selling Conservation to the Public

All parts of the country face the problem of making people aware of the urgent need for conservation in some form. In Utah, this work has been carried on both by organizations and individuals. Among the former are canal companies, sugar factories, groups of citizens, and the Agricultural College. The Governor of the State, his Drought Committee, and the State Engineer have constantly worked to this end. With a return to more normal rainfall conditions when the need for conservation is not so easily seen, this work may become more difficult but must be continued.

Other Types of Conservation

Additional conservation plans propose (1) the protection of wildlife, (2) the establishment of recreational areas, (3) the pursuit of research, (4) reclamation of water logged and alkali lands within irrigated districts, (5) the administration of plans for large areas based on major drainage basins rather than on states, (6) the coördinating of land units so that pattern and size are suited to the type of development of the region.

Many geographic writers such as Semple, Huntington and Hahn have shown the ill effects of man's careless use in the past of his natural resources. Soil erosion is one of the greatest problems facing the country today and unless speedy action is taken the semi-arid region in Utah will become in fact a part of "The Great American Desert."

AN EFFECTIVE PROBLEM METHOD

WILLIAM KESSELMAN
Oklahoma Avenue School, Milwaukee, Wisconsin

For a number of years teachers of geography have been talking about teaching by problems. Thousands of teachers have tried it, but have found that they, and not the child solve the problems. The problem method needs no justification, pedagogical literature is filled with praise of its social implications.

Some of us forget, that the child must be taught to recognize a problem and its elements, before he is given problems to solve.

To teach the child to think of life and geography in terms of problems, the following four steps have been planned:

1. Introduce the child to problems.
2. Give the child the problem and the elements, then help him learn to find the details for its solution.
3. Discuss the material which would raise a problem in the child's mind by the presentation of certain information.
4. Let the children find problems by extensive reading.

Each of the above steps is given a semester. In this article the first part of the plan will be illustrated by the problem, "When we talk about climate, what do we mean?"

Adults like to name the new born child, children like to name the new dog or nickname their friends. Teachers of reading have capitalized on this desire. They have given children stories without titles, and by asking the child to give the story a title, they have been able to motivate better comprehension.

By a method analogous to the one used in reading, the child can slowly be led to the methods of problem solving. The method can best be illustrated by what is done. At the end of this teachers' introduction is a problem which is to be mimeographed or hectographed and distributed.

PRESENTING THE PROBLEM

With the mimeographed material in the hands of the child, the presentation is continued by asking the youngsters to recall, the time when they were very small boys and girls, who toddled along to the grocery store with their mothers. Once among the barrels and boxes, they would ask mother the names of this that and the other thing. Soon they knew something about the grocery store.

A teacher could continue in these words, "Here we have a ques-

tion or a problem,—When we talk about climate, what do we mean?'' Certain facts will solve this problem. One fact is discussed under each number. (See the problem at the end of this article.) Read the paragraph under number one and give it a name, if you can't think of a name the first time you read the paragraph, read it over again. If you still can't think of a name, skip it and go on to the next one. Then after you have completed the others go back to those you have skipped, and you will probably have a name in mind. Let's see who can give the best name.''

To care for individual differences such as rate of reading and comprehension, at the end of the problem on climate the following have been placed:

1. What is a cyclone?
2. What does humidity mean, and how do they find out how much there is?
3. Make a rainfall map of the United States.
4. Make a growing season map of the United States.

To do these things the child will make use of the supplementary material and encyclopedias in the classroom.

The Solution in Action

About thirty minutes gives all children ample time to read and name the work in climate. The teacher then asks for the titles chosen for the first paragraph. (For brevity only one of the titles given by the children will be given here.) The titles are written on the blackboard by the teacher. As each child gives his title, he is asked why he has chosen it. He may quote part of the paragraph. When five or six titles have been listed, the teacher asks the class to choose the title which best fits the paragraph. Here the content of the paragraph is digested and absorbed thru discussion. The spirit of competition is satisfied in the attempt to be the one to have the chosen title. The spirit of cooperation is developed in finding the most fitting name.

Each paragraph or groups of paragraphs is discussed and the title chosen. Let's say the titles chosen are:

1. Growing season
2. Temperature
3. Rainfall
4. Effect of a large body of water
5. Winds change rainfall and temperature
6. How the Weather Bureau helps us

The children can be shown that the above are the six facts which we talk about, when we talk about the climate of a place. These facts are the elements mentioned in the second step of the general

plan. The children can readily be shown that the wealth of details surrounding the skeleton facts are necessary for the solution of the problem.*

PROBLEM: WHEN WE TALK ABOUT CLIMATE, WHAT DO WE MEAN?

1

When a farmer knows there will be no more frosts, he can plant his seeds. The kind of seeds he plants will depend upon the number of days in which there will be no frosts. In and around Milwaukee the farmers know that they can plant those things which will ripen in about 160 days. Around the Gulf of Mexico the farmers can plant those things which need about 260 days or less to ripen. In southern Florida and southern California the growers can plant almost anything, because they seldom have frosts, making the growing period there about 365 days. The length of time in which it is possible to grow crops is called the growing season.

2

Besides having a long growing season in Florida, it is always quite warm there. On the New England coast, it is as cold as it is in Milwaukee during the winter and as warm as in the summer. In the Adirondack Mountains it sometimes gets to be 40° below zero. This is because it is so far inland and so much farther north than Florida. So we have some places which are very cold, some not so cold and some very hot. When we tell about how hot or how cold a place is, we tell it by giving the temperature we find there. Therefore in telling about climate we tell about the temperature of the place.

3

If we set out a tin can to catch the rain that fell in Milwaukee every time we had a rainstorm, and melted the snow every time there was a snowstorm, and then measured all this water without losing any by evaporation, we would have a tin can between thirty and forty inches deep. It is important to know the amount of rain which falls in a certain place. We cannot grow rice in the deserts of Arizona, altho it may be warm enough. We could not mine borax in the valley of California, if it rained there, as it would all be washed away in solution. It was the right amount of moisture in

* Because it is necessary to use this type of presentation for a period of time, a series of problems like the one which follows will be presented in future editions of the JOURNAL.

the air that kept the cotton fibers soft in Manchester, England, making possible the large textile industry. So it is important to know something about the rainfall for crops and industry.

4

Places like northern Minnesota sometimes have temperatures as high as 102° in the summer and 50° below zero in the winter. But no places on the coast of Maine or Washington ever have such high temperatures during the summer because the cool winds from the ocean cools the land. During the winter it never gets so cold because the winds from the ocean are warmer than the cold land. Thus the ocean, or any large body of water like Lake Michigan, helps keep the temperature more even the year around. This climate is known as the "Oceanic climate." Milwaukee's climate would be more "oceanic" if the winds blew from the east instead of from the west as they do. Places like northern Minnesota are said to have a "Continental climate."

5

If we were to examine the trees in an open field, we would notice that more branches face the east than the west. If we would watch a weather vane for a number of days, we would soon see that the winds blow from the west or southwest much of the time.

If we examined a rainfall map of the United States, we would find over 60 inches of rainfall from central California to Canada, twice as much as in Milwaukee. The winds which come from the ocean carry a great deal of water. As these winds rise on the mountain slopes, they cool and therefore drop much of their moisture. The mountain slopes are therefore covered with heavy forests. But after the winds have passed over the mountains they are dry, because they again descend and are warmed, and have also lost part of their moisture on the mountain slopes. When winds are warmer they can hold more moisture, therefore, instead of watering the land they dry it. From the Rocky Mountains to the Dakotas, Nebraska, Kansas, Oklahoma and Texas the plateau and the vast plains have little rainfall because of the drying winds. These states have about ten inches or a third to one-fourth that of Milwaukee. Therefore winds are important in the climate of a region.

6

We would like to know if it is going to rain for our Sunday picnic or whether it is going to be colder or warmer so we can go swimming. On Saturday night we look at the paper and we can

usually depend on the weather report found in our newspaper. How can the weather man tell us that?

From hundreds of places in the United States, the following facts are sent to about half a dozen main branches of the United States Weather Bureau: 1) The amount of rain which fell, if any; 2) The temperature; 3) The direction of the wind, its speed and the amount of moisture in the air in that place; 4) The condition of the sky; 5) The pressure of the air.

These facts are then put on a map. From this map, people who are trained in telling the weather, send their reports to the newspapers.

The Weather Bureau not only helps us on picnics, but warns vessels at sea about storms, the farmers about frosts, the fliers about storms, and of approaching floods. The Weather Bureau not only saves many human lives, but protects our food supply.

WHAT IS IT?

It has latitude, longitude, and many a bay,
It has oceans and rivers where many fish play.
It has cities and towns and valleys so fair,
With beautiful mountains to climb if you dare.
In some places it's cold, in others it's hot,
And some places where you'd wish you were not.

Now try to guess it for this tale is true,
Do try and see how well you can do.

MARGARET RAYMOND
Seventh Grade

School of Practice,
State Teachers College,
Buffalo, N.Y.

EDITORIAL NOTES AND NEWS

New records are being made with great frequency. At 3:40 P.M., October 24, the New Zealand flyer, Jean Batten, landed at the Lympne airport in England, having accomplished a record flight from Australia in 5 days, 18 hours, and 15 minutes. The previous best record, which was made by H. F. Broadbent in May, 1937, was beaten by 14 hours and 10 minutes. The route of Jean Batten started at Darwin, and lay thru Batavia, Alor Star, Allahabad, Karachi, Basra, Damascus, Naples, and Marseilles to England. Trace this route on your map.

Dr. Helen M. Strong, of the United States Soil Conservation Service, spoke at the Iowa State Teachers Association, and Iowa State Teachers College in November. Accompanied by Mr. Combs and Mr. John of the Des Moines office of the Survey, she visited the State Teachers College at Mankato, Minnesota, speaking before a large assembly of students. All teachers interested in the problems of conservation should make contact with the district office of the Soil Conservation Service. It is highly probable that some interesting work is being done nearby.

A movement is on foot to create a National Park out of a hundred square miles of natural seashore land in the Cape Hatteras region of North Carolina. Much of this dune country with its unspoiled natural plant and animal life is already government owned. Besides its scenic and natural history value, the area is rich in historical lore associated with Sir Walter Raleigh's unsuccessful colony, as well as the site of the first successful airplane flight, made by the Wright brothers in 1903.

The hide industry of Argentina has solicited the Federal and Provincial Governments to enact legislation restricting, and possibly abolishing, the use of barbed wire fencing for animal enclosures. Rips and tears in hides reduce their value in leather manufactures. The meat-packing plants and veterinarians are also claiming that the health of cattle may be impaired by gashes from barbed wire. If the legislation is passed it will have a serious effect on barbed wire purchases in the United States.

The Press Service of the United States Department of Agriculture estimates that the increase of one thirty-second of an inch in the staple length of cotton which has been attained from 1928 to 1934 has added $8,000,000 to the value of the 1934 cotton crop.

The Geography Section of the Maryland State Teachers Association held its annual meeting in Baltimore, October 29. Dr. J. T. Singewald, Jr. delivered an address on "Cape To Cairo By Automobile." Professor E. Curt Walther, head of the geography department at the State Teachers College, Towson, Maryland, is the chairman of the section.

J. Sullivan Gibson, formerly with the T.V.A., is now the head of the geography department in the Alabama State Teachers College at Livingston. Ernest J. Murphy is the other member of the department. Students in this college take geography during their first two years of work.

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Every teacher of geography and every person interested in education should take advantage of this liberal offer. The National Council extends to you an invitation to become a member and avail yourself of this opportunity. Send your orders directly to

THE JOURNAL OF GEOGRAPHY
3333 Elston Ave., Chicago, Ill.

R. H. Whitbeck, Loyal Durand, Jr., and J. Russell Whitaker. **The Working World.** 704 pp. 341 maps and illustrations. American Book Co., New York. $2.20.

"Geography as a separate school subject has been under constant attack for many years. Yet in the same period geography as a school subject has changed greatly."[1]

At the same time, texts for this subject have gone thru a remarkable metamorphosis. *The Working World, an Economic Geography,* is an example of a modern text almost wholly in keeping with the modern idea of geographical education.

Some of the especially good features of this book are: 1) The photographs are good and the method of calling attention to them make them a valuable part of the informational material. 2) The chapter summaries will be of great help to the student. 3) Many of the "Exercises" and "Topics for Further Study" will stimulate research work on the part of ambitious students. 4) As an introduction to a study of economic geography, the section describing the United States—"A Country of Great Diversity"—is without a doubt an excellent feature, since without some knowledge of the natural environment of a region the economic activities cannot be readily understood. Such topics as "Diversity of Climate and Natural Vegetation," "Diversity of Land Surface," "Diversity in Mineral Resources," provide the geographic background for an understanding of the economic life of the United States by regions. 5) The section dealing with economic geography, specifically in the United States, is very thoro. 6) The maps and informational material dealing with foreign countries are outstanding features. 7) In Part X, pages 641 to 657 there is an excellent summary of the chief producing regions and world trade. 8) The authors have given a rather complete list of selected reference books and some excellent maps and tables as the finish of the book. 9) The index, in contrast with that of many books, is really splendid.

Many other books dealing with the United States contain similar glorious descriptions of the country and then, apparently as an afterthought, add something similar to this:

"Although the natural resources of the nation are vast and varied, it is well to remember that they are neither entirely adequate to meet the needs of the nation nor are they inexhaustible. Our nation is largely dependent . . . minerals as antimony, chromite, nickel, and tin; and climatic limitations make it impossible . . . tropical commodities . . . such as rubber, cacao, and bananas." p. 28.

If a part of this had been incorporated in the paragraphs "Great Minerals Resources" and "Agricultural Resources," a more accurate picture would have been imprinted upon the mind of the child who uses the book. In that case the pupil would have the correct idea to "remember" when called upon as in the following:

"It is well to remember, however, that our natural resources are neither entirely adequate to meet the needs of the nation, nor are they inexhaustible." p. 41.

On the whole, however, *The Working World* is worthy of consideration by those seeking an economic geography as a classroom reference book or as a text.

CLARA SYMONDS

Senior High School
Quincy, Ill.

[1] *Social Education,* March 1937, page 166.

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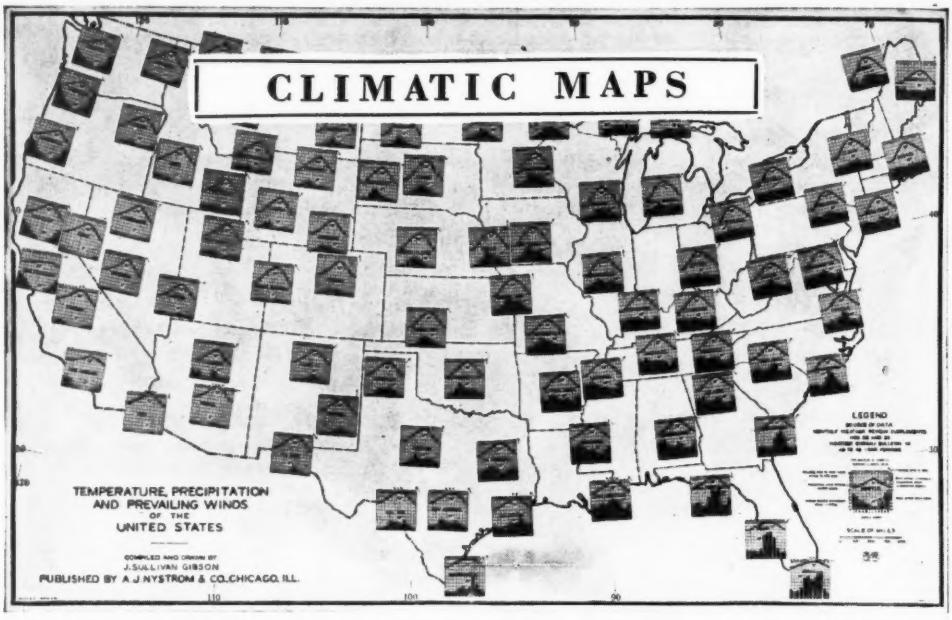

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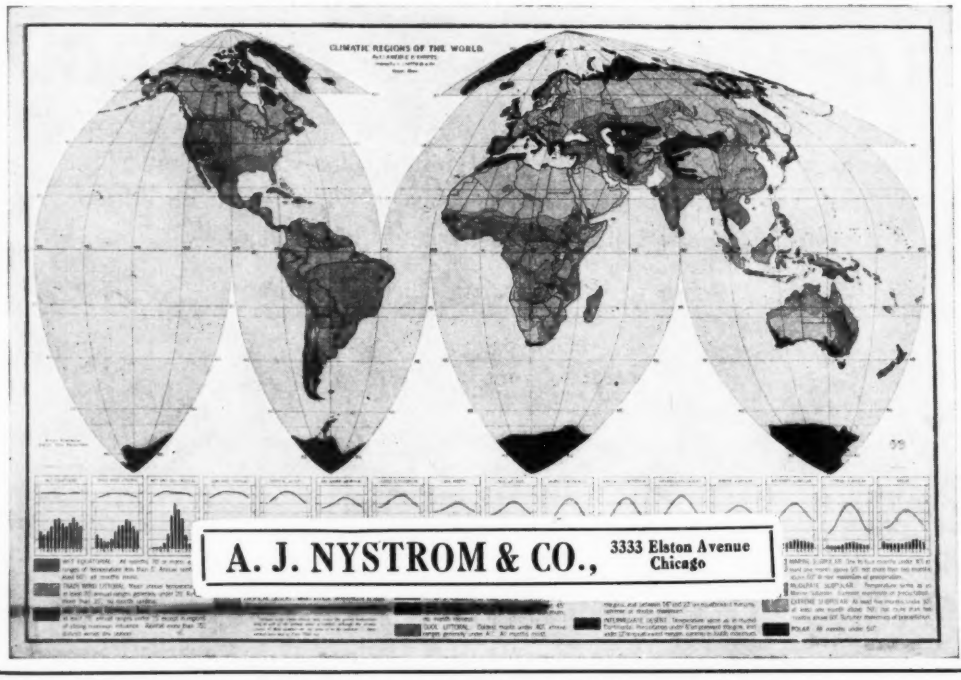

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ANNUAL MEETING

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NATIONAL COUNCIL *of* GEOGRAPHY TEACHERS

The program for the Ann Arbor meeting is beginning to take shape. The discussions will center around the general theme *Researches Needed in the Teaching of Geography.* The first session will be held at 10:00 o'clock Monday morning, December 27, on the subject of *Geography in Education.* Two papers will be presented, one on the *Goals of Education and Implications for Teachers of Geography* and another on *A Philosophy of Geography for the Schools of a Democracy.* The Monday afternoon session will deal with *Researches Needed in the Teaching of Geography at College Levels.* Two later sessions will be given over to a consideration of corresponding researches at secondary and elementary school levels.

Rooms in the Michigan Union will be available to guests for $2.00 and $3.00 per day single, and for $4.00, $5.00, and $6.00 per day double. Reservations may be secured by writing Mr. S. G. Walz, Manager, Michigan Union, University of Michigan, Ann Arbor, Michigan.

The president of the National Council is proceeding on the assumption that our organization is uniquely able to promote research in the teaching of geography. He thinks that we should devote this year to taking an objective view of the situation and if possible to the setting up of machinery for an aggressive movement on all fronts. Your attendance and cooperation is earnestly solicited. The tentative program appeared in the November issue of the JOURNAL.

Sincerely,

EARL E. LACKEY, *President*

NEW PUBLICATIONS

Port and Terminal Charges at United States Ports. Miscellaneous Series No. 1 (1937 edition). Prepared by the Board of Engineers for Rivers and Harbors, War Department. 727 pp. Supt. of Documents, Washington, D.C. 1937. $1.00.

Information on services and charges of the Federal Government and local port authorities applicable to vessels, freight, and passengers at U. S. ports.

Cumulative Index to the National Geographic Magazine, 1899 to 1936 inclusive, with a foreword by Gilbert Grosvenor. 452 pp. Illustrated. National Geographic Society, Washington, D.C.

The foreward contains a resumé of the history of the development and the activities of the National Geographic Society and its magazine.

Thomas A. Blair. **Weather Elements.** 401 pp. Illustrated. Prentice-Hall, Inc., New York. 1937. $4.00.

A text in elementary metreorology giving an understanding of the physical processes underlying weather elements, solar radiation, and their interrelations; the instruments and methods used to measure them; the basis of forecasting; the general circulation of the atmosphere and the distribution of weather elements, and the relations of weather to man's activities.

Walter Gailey Hoffman. **Pacific Relations.** 539 pp. Illustrated. McGraw-Hill Book Co., Inc., New York. 1936. $1.98.

The races and nations of the Pacific area and their problems.

Edna E. Eisen. **Our Country from the Air.** 212 pp. Illustrated. Wheeler Publishing Co., Chicago. 1937. $1.30.

Excellent full-page aerial views with directions for interpretations of a great variety of landscapes.

Public Works Planning. Dec., 1936. 221 pp. *Illustrated;* **Regional Planning.** Part III. New England. July, 1936. 101 pp. Illustrated; National Resources Committee. June, 1936. **Progress Report.** 61 pp. Illustrated; **Report on the Works Program,** Mar. 16, 1936. 106 pp. Illustrated; **Future of the Great Plains.** Report of the Great Plains Committee. 194 pp. Illustrated. U. S. Government Printing Office, Washington, D.C.

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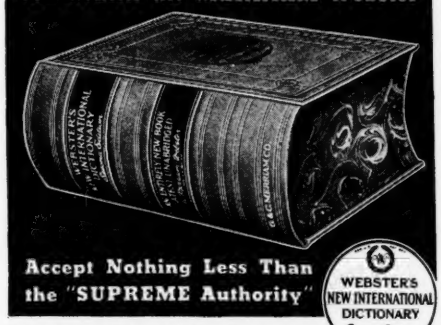

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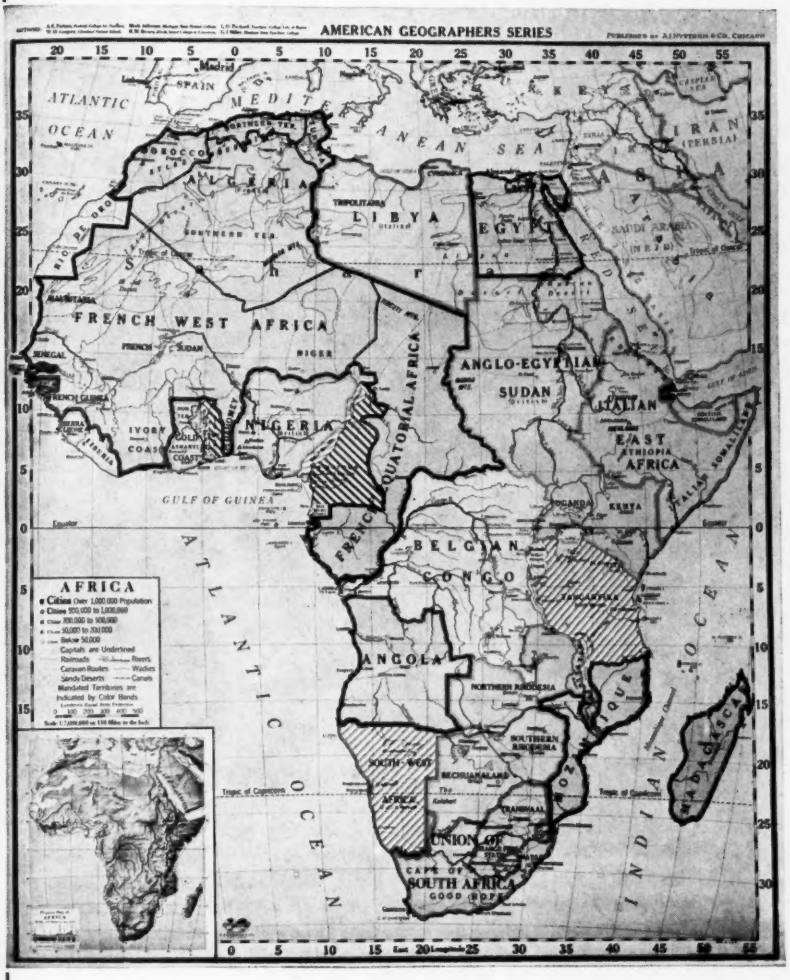

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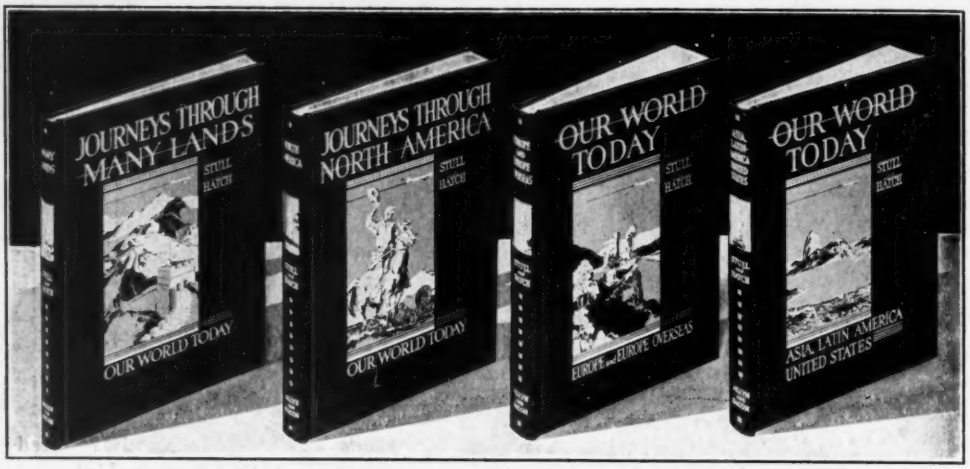

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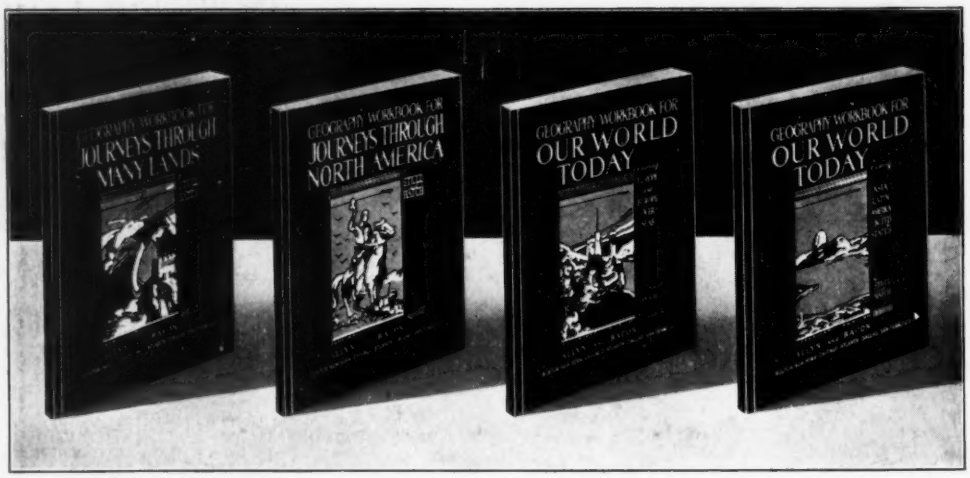
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